

US-PAT-NO: 5333212

DOCUMENT-IDENTIFIER: US 5333212 A

TITLE: Image compression technique  
with regionally selective  
compression ratio

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INVENTOR-INFORMATION:

NAME	STATE	ZIP CODE	CITY	COUNTRY
Ligtenberg; Adrianus	CA	N/A	Palo Alto	

APPL-NO: 07/ 978312

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PARENT-CASE:

This is a continuation of application of Ser. No. 07/664,256 filed Mar. 4, 1991, now abandoned.

US-CL-CURRENT: 382/250, 375/240.01 , 375/240.22 , 382/264

ABSTRACT:

An enhancement to a standard lossy image compression technique wherein a single set of side information is provided to allow decompression of the compressed file. Certain portions of the image are selected (either by the user or automatically) for more compression than

other portions of the image. A particular embodiment is implemented for use with the JPEG image compression technique. JPEG calls for subdividing the image into blocks, transforming the array of pixel values in each block according to a discrete cosine transform (DCT) so as to generate a plurality of coefficients, quantizing the coefficients for each block, and entropy encoding the quantized coefficients for each block. Techniques for increasing the compression ratio include subjecting each selected block to a low pass filtering operation prior to the transform, subjecting the coefficients for each selected block to a thresholding operation before the quantizing step, subjecting the coefficients for each selected block to a downward weighting operation before encoding them, or, where the entropy encoding uses Huffman codes, mapping coefficients to adjacent shorter codes.

31 Claims, 7 Drawing figures

Exemplary Claim Number: 1

Number of Drawing Sheets: 3

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Detailed Description Text - DETX (22):

When the quantized **AC coefficients** are ordered in the zig-zag pattern described above, the string of quantized coefficient values will be characterized by runs of 0's interrupted by

**non-zero** values. Although the individual coefficients are 10-bit numbers, the actual coefficient value will typically be a number of fewer bits with leading bits that are 0's. A unique code is assigned to each possible combination of run length and number of bits. The code is thus characterized by an integer pair, namely run/size. The run length is constrained by the number of AC coefficients (63), but in order to keep the code tables more manageable, a maximum run of 15 is permitted. Combinations with a zero size are undefined, but 0/0 is assigned a code to designate end of block (EOB) and 15/0 is assigned a code to specify a zero run length (ZRL) of 15 followed by one or more 0's.

Detailed Description Text - DETX (42):

A simple type of filter is a **moving average** filter, which removes high frequency spatial components by substituting for a given pixel value the average value of some number of neighboring pixels.

The larger the number of neighboring pixels that are averaged, the greater the degree of filtering. It is preferred to use a rectangular filter that averages an array of M rows and N columns. In this regime, the filtering operation is described by the following equation: ##EQU2## Where  $s'.sub.yx$  is the average value of the M.times.N block of pixels with the upper left corner being at (yx).

Since this **moving block average** must be computed for each pixel, significant efficiencies can be achieved by recognizing that most of the computation has already been performed

for a given average. For example, once the average for a given pixel position has been calculated, the average value for the pixel one row below it may be computed by taking the previous average value, subtracting the contribution from the previous row and adding the contribution of the new row. This may be seen as follows: ##EQU3## A similar extension applies to horizontally adjacent pixels.